CLAIMS

1. A method of approximating log-likelihood ratio metrics for a plurality of turbo encoded symbols, the plurality of turbo encoded symbol having been modulated with M-ary phase shift keyed signal constellations having gray code labeling, the method comprising the steps of:

extracting a complex-valued modulation symbol soft decision on a modulation symbol, the modulation symbol being associated with a plurality of turbo encoded symbols, the complex-valued modulation symbol soft decision having an in-phase component and a quadrature component;

scaling the quadrature component to obtain a log-likelihood ratio metric for a most-significant code symbol of the modulation symbol;

scaling the in-phase component to obtain a log-likelihood ratio metric for a second-most-significant code symbol of the modulation symbol; and

applying a product of a first number and a second number to the complex-valued modulation symbol soft decision to obtain log-likelihood ratio metrics for remaining code symbols of the modulation symbol, the first number being dependent on a magnitude of the complex-valued modulation symbol soft decision, and the second number being dependent on a phase of the complex-valued modulation symbol soft decision.

2. The method of claim 1, further comprising the steps of calculating the cosine value of an angle of the complex-valued modulation symbol soft decision, and scaling the cosine value to generate the second number.

3. The method of claim 1, further comprising the steps of raising the complex-valued modulation symbol soft decision to a power, extracting a real part of the complex-valued modulation symbol soft decision raised to the power,

and dividing the real part by a power of the magnitude to generate the second number.

4. The method of claim 1, further comprising the steps of scaling the magnitude by a first plurality of different scale factors to generate a first plurality of scaled magnitudes, exponentiating each of the first plurality of scaled magnitudes, summing the exponentiated scaled magnitudes, calculating the logarithm of the sum to generate a first log value, scaling the magnitude by a second plurality of different scale factors to generate a second plurality of scaled magnitudes, exponentiating each of the second plurality of scaled magnitudes, summing the exponentiated scaled magnitudes, calculating the logarithm of the sum to generate a second log value, and subtracting the second log value from the first log value to generate the first number.

5. The method of claim 1, further comprising the step of scaling the magnitude to generate the first number.

6. A receiver configured to approximate log-likelihood ratio metrics for a plurality of turbo encoded symbols, the plurality of turbo encoded symbol having been modulated with M-ary phase shift keyed signal constellations having gray code labeling, the receiver comprising:

a demodulator configured to extract a complex-valued modulation symbol soft decision on a received modulation symbol, the modulation symbol being associated with a plurality of turbo encoded symbols, the complex-valued modulation symbol soft decision having an in-phase component and a quadrature component; and

a log-likelihood ratio computation module coupled to the demodulator and configured to receive the complex-valued modulation symbol soft decision from the demodulator, scale the quadrature component to obtain a

log-likelihood ratio metric for a most-significant code symbol of the modulation symbol, scale the in-phase component to obtain a log-likelihood ratio metric for a second-most-significant code symbol of the modulation symbol, and apply a product of a first number and a second number to the complex-valued modulation symbol soft decision to obtain log-likelihood ratio metrics for remaining code symbols of the modulation symbol, the first number being dependent on a magnitude of the complex-valued modulation symbol soft decision, and the second number being dependent on a phase of the complex-valued modulation symbol soft decision.

7. The receiver of claim 6, wherein the log-likelihood ratio computation module is further configured to calculate the cosine value of an angle of the complex-valued modulation symbol soft decision, and scale the cosine value to generate the second number.

8. The receiver of claim 6, wherein the log-likelihood ratio computation module is further configured to raise the complex-valued modulation symbol soft decision to a power, extract a real part of the complex-valued modulation symbol soft decision raised to the power, and divide the real part by a power of the magnitude to generate the second number.

9. The receiver of claim 6, wherein the log-likelihood ratio computation module is further configured to scale the magnitude by a first plurality of different scale factors to generate a first plurality of scaled magnitudes, exponentiate each of the first plurality of scaled magnitudes, sum the exponentiated scaled magnitudes, calculate the logarithm of the sum to generate a first log value, scale the magnitude by a second plurality of different scale factors to generate a second plurality of scaled magnitudes, exponentiate each of the second plurality of scaled magnitudes, sum the exponentiated scaled magnitudes, calculate the logarithm of the sum to generate a second log

value, and subtract the second log value from the first log value to generate the first number.

10. The receiver of claim 6, wherein the log-likelihood ratio computation module is further configured to scale the magnitude to generate the first number.

11. A receiver configured to approximate log-likelihood ratio metrics for a plurality of turbo encoded symbols, the plurality of turbo encoded symbol having been modulated with M-ary phase shift keyed signal constellations having gray code labeling, the receiver comprising:

means for extracting a complex-valued modulation symbol soft decision on a received modulation symbol, the modulation symbol being associated with a plurality of turbo encoded symbols, the complex-valued modulation symbol soft decision having an in-phase component and a quadrature component;

means for scaling the quadrature component to obtain a log-likelihood ratio metric for a most-significant code symbol of the modulation symbol;

means for scaling the in-phase component to obtain a log-likelihood ratio metric for a second-most-significant code symbol of the modulation symbol; and

means for applying a product of a first number and a second number to the complex-valued modulation symbol soft decision to obtain log-likelihood ratio metrics for remaining code symbols of the modulation symbol, the first number being dependent on a magnitude of the complex-valued modulation symbol soft decision, and the second number being dependent on a phase of the complex-valued modulation symbol soft decision.

12. A receiver configured to approximate log-likelihood ratio metrics for a plurality of turbo encoded symbols, the plurality of turbo encoded symbol having been modulated with M-ary phase shift keyed signal constellations having gray code labeling, the receiver comprising:

a processor; and

a processor-readable storage medium coupled to the processor and containing a set of instructions executable by the processor to extract a complex-valued modulation symbol soft decision on a received modulation symbol, the modulation symbol being associated with a plurality of turbo encoded symbols, the complex-valued modulation symbol soft decision having an in-phase component and a quadrature component, scale the quadrature component to obtain a log-likelihood ratio metric for a most-significant code symbol of the modulation symbol, scale the in-phase component to obtain a log-likelihood ratio metric for a second-most-significant code symbol of the modulation symbol, and apply a product of a first number and a second number to the complex-valued modulation symbol soft decision to obtain log-likelihood ratio metrics for remaining code symbols of the modulation symbol, the first number being dependent on a magnitude of the complex-valued modulation symbol soft decision, and the second number being dependent on a phase of the complex-valued modulation symbol soft decision.

13. The receiver of claim 12, wherein the set of instructions is further executable by the processor to calculate the cosine value of an angle of the complex-valued modulation symbol soft decision, and scale the cosine value to generate the second number.

14. The receiver of claim 12, wherein the set of instructions is further executable by the processor to raise the complex-valued modulation symbol soft decision to a power, extract a real part of the complex-valued modulation

symbol soft decision raised to the power, and divide the real part by a power of the magnitude to generate the second number.

15. The receiver of claim 12, wherein the set of instructions is further executable by the processor to scale the magnitude by a first plurality of different scale factors to generate a first plurality of scaled magnitudes, exponentiate each of the first plurality of scaled magnitudes, sum the exponentiated scaled magnitudes, calculate the logarithm of the sum to generate a first log value, scale the magnitude by a second plurality of different scale factors to generate a second plurality of scaled magnitudes, exponentiate each of the second plurality of scaled magnitudes, sum the exponentiated scaled magnitudes, calculate the logarithm of the sum to generate a second log value, and subtract the second log value from the first log value to generate the first number.

16. The receiver of claim 12, wherein the set of instructions is further executable by the processor to scale the magnitude to generate the first number.